EEB 3273: LECTURE EXAM 1 SAMPLE QUESTIONS

Comparative Vertebrate Anatomy (Schwenk)

NOTE: ***These are just examples and do not cover all of the material. They are unlikely to show up exactly like this on the actual exam, but similar questions might appear.***

(1) True or False (**T** or **F**)

T Neural crest cells are derived from embryonic ectoderm

F The ceratohyal cartilage of a shark is homologous to the columella

T Bone serves a physiological, as well as a structural, function.

F 'Anagenesis' is when morphological evolution occurs during speciation

F According to Richard Owen, two parts can only be analogous if they are also homologous

F The elements that form the jaw joint in a bony fish are the articular and dentary

(2) Chordates, along with echinoderms, are 'deuterostomes'—what does this mean?

The name 'deuterostome' means 'second mouth'. It refers to the fact that in embryos of this group, the mouth forms as a second opening to the gut tube in the gastrula; the first opening to form is the is blastopore, which in deuterostomes eventually becomes the anus.

(3) Indicate with an **H** or a **C** whether the *phenotypic similarity* between the structures in each pair is due to HOMOLOGY or CONVERGENCE (a type of HOMOPLASY).

C mosquito wing—bat wing

C bird wing—bat wing

H bird wing bones—bat wing bones

C elephant tusk (incisor tooth)—walrus tusk (canine tooth)

C dorsal fin on a shark—dorsal fin on a dolphin

H lung in a lungfish—lung in an aardvark

C roof of braincase in a shark—roof of braincase in a human

H femur of deer mouse—femur of mouse deer

(4) What are the three main components of connective tissues?

1. **living cells**
2. **ground substance**
3. **fibers**

(5) (a) Describe the principal difference(s) between hyaline cartilage and fibrocartilage.

The principal difference between the two cartilage types is in the quantity of collagen fiber found in the matrix (i.e., within the ground substance). Fibrocartilage has much more collagen fiber than hyaline cartilage. This makes fibrocartilage much tougher than hyaline cartilage.

(b) Give an example of where each type of cartilage is found:

hyaline cartilage—synovial joint surfaces

fibrocartilage—intervertebral discs

(6) During early development, animals pass through a series of developmental stages, including the following: **gastrulation, morula, zygote, blastula, neurulation, fertilization**. In the table, below, put these in the correct sequence (1 = earliest) and in the right column, say something descriptive or significant about each stage (what is it, what happens, etc.).

DEVELOPMENTAL STAGE	DESCRIPTION OR SIGNIFICANT EVENT
1. fertilization	**haploid sperm and egg nuclei combine to form diploid zygote**
2. zygote	**a fertilized ovum; a single, diploid cell; the earliest 'embryo'**
3. morula	**solid ball of cells derived from early cell cleavages of zygote**
4. blastula	**embryo as a hollow ball of cells with a cavity (blastocoel) inside**
5. gastrulation	**cell movement and involution at the blastopore to form 3 germ layers**
6. neurulation	**formation of neural plate in ectoderm, followed by plate rolling up into neural tube**

(7) In the blank on the left, place a **C**, **D** or **S** for chondrocranium, dermatocranium or splanchnocranium, respectively, to identify the embryonic/evolutionary source of the listed element. If the element is not derived from any of these, place an **N** for 'none'.

C = chondrocranium

S = splanchnocranium

D = dermatocranium

N = none of the above

S hyomandibula of a bony fish

D armor plates on head of in extinct, jawless fish

S gill skeleton of a bony fish

C gill skeleton of shark

C back of braincase in a mammal

D roof of braincase in a reptile

N thoracic vertebrae in a mammal

S Meckel's cartilage in a human embryo

N scapula in the pectoral girdle of a fish

N armadillo shell

C otic caspsule

(8) *Compare and contrast* the following pairs of words using text (not drawings). The words have some sort of *relationship*—it might be ***anatomical*** (e.g., they are physically connected), ***functional*** (e.g., they both perform the same function in different animals, or they both work together in a single animal to perform a particular function), developmental (e.g., they share something about their embryonic development), ***evolutionary*** (e.g., they are homologues) or ***conceptual*** (e.g., they are alternative explanations for the same or related phenomena)

YOU MUST SHOW THAT YOU UNDERSTAND EACH TERM ON ITS OWN **AND** *ESPECIALLY HOW THEY ARE RELATED TO ONE ANOTHER.*

NOTE: In the actual exame *YOU WILL GET TO LEAVE SEVERAL BLANK, i.e.., YOU WILL HAVE A CHOICE ABOUT WHICH ONES TO ANSWER—THESE ARE JUST SAMPLES*

PERFECT ANSWERS: Might be as short as 3 sentences, but usually require a short paragraph. *Do not write too much*—if you use a 'shotgun' approach in which you just write everything you can think of, you will lose points… Focus on *how the two terms are interrelated*. Drawings are *not* acceptable answers.

I'VE PROVIDED JUST ONE EXAMPLE OF A 'PERFECT' ANSWER. NOTE THE FIRST, UNDERLINED STATEMENT—THIS IS THE KEY ELEMENT BECAUSE IT EXPLAINS HOW THE TWO TERMS ARE RELATED.

homoplasy—symplesiomorphy

Homoplasy and symplesiomorphy are both potential explanations for why characters or traits in two or more species are similar in form. If the characters simply failed to evolve or change from the shared ancestral condition, then the phenotypic similarity among species merely reflects the retention of that ancestral ('primitive') condition, known as *symplesiomorphy*. However, if the similarity evolved independently in the different lineages/clades from different ancestral conditions, then the phenotypic similarity is the result of convergent evolution, probably caused by adaptation to similar conditions. Convergence is a type of *homoplasy*.

Aristotelian hierarchy—phylogeny

endochondral—dermal

Urochordata—Vertebrata

sensory capsule—neurogenic placode

ontogeny—phylogeny

anagenesis—cladogenesis